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about teaching algebra so that our students can understand what algebra is. Exactly what is algebra? The people who wrote the curriculum standards seem to think they tell us what algebra is, but I do not agree with them. According to what I learned over the years, every subject in mathematics consists of these five parts:

1. A set of things
2. A few axioms
3. A few undefined terms
4. Definitions
5. Theorems

From the standpoint of teaching and learning, I considered mathematics as essentially a collection of definitions and theorems. And this is how I taught mathematics. The heart of my teaching was a list of axioms, definitions, and theorems. I know that some readers will think that they can attack what I just said. Not so. The challenge is out.

It seems that his article is a good example of what students hear in the classroom and read in textbooks. My forty-five years of teaching and my thirteen years as a college student have taught me that this type of communication kills off students.

Chazan is only a victim of the classroom and textbook teaching. He probably did a better job in this article than I did during my first years of teaching.

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Symmetry

The graph of a function $f(x)$ has a vertical axis of symmetry $x = d$ if it can be shown that $f(d - e) = f(d + e)$ for all real e except zero. This pursuit leads to a very elegant method to show that the graph of any quadratic function of y against x is symmetrical with respect to a vertical line.

Let $f(x) = ax^2 + bx + c$ where $a \neq 0$. Then

$$\begin{aligned} f(d-e) &= f(d+e) \\ &\leftrightarrow a(d-e)^2 + b(d-e) + c \\ &= a(d+e)^2 + b(d+e) + c \\ &\leftrightarrow -2ade - be = 2ade + be \\ &\leftrightarrow -4ade = 2be \\ &\leftrightarrow d = \frac{-b}{2a}. \end{aligned}$$

So the quadratic function $ax^2 + bx + c$ has a vertical axis of symmetry $x = -b/2a$.

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Correction, 25 March

In the September 1992 "Reader Reflections," a printing error occurred in the letter entitled "25 March 1992" (p. 484). In the first paragraph of the proof the text should read ". . . $(n - 1)$ matches are played, . . ." not $n(n - 1)$.—*Ed.*

10 May 1992

Calendar problem 10 in the May 1992 *Mathematics Teacher* has a general solution using a compound-interest approach.

The problem: "Mr. Green receives a 10 percent raise every year. His salary after four such raises has gone up by what percent?"

The compound interest formula is

$$A = P\left(1 + \frac{i}{n}\right)^{nt},$$

where A is final salary, P = initial salary, i = percent raise, n = number of compounding periods, and t = time in years. Note that we have taken the liberty of substituting variables in the formula to fit this particular problem. Since this is a general solution, let $P = x$, but, of course, P must be known for a computation. Thus, we have

$$\begin{aligned} A &= x\left(1 + \frac{0.10}{1}\right)^{(1)(4)} \\ &= x(1.10)^4 = 1.4641x. \end{aligned}$$

The ending salary is $\$1.4641x$, after four years. The coefficient of x multiplied by the beginning salary yields the current salary. The decimal portion of the coefficient of x is the percent of increase. If the coefficient is greater than 2, then the percent of increase is the *difference* between the coefficient and 1. Let us prove this statement. The contributor of the problem demonstrates with a beginning salary of $100.00:

$$A = 1.4641 \ (\$100.00),$$

where $x = 100.00$.

$$A = \$146.41,$$

and a difference of $46.41 from the beginning salary results. Then

$$\frac{\$46.41}{\$100.00} = 0.4641 = 46.41\%.$$

The compound-interest formula is very appropriate for this type of problem.

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In NCTM journals

Readers of the *Mathematics Teacher* might enjoy the following articles in this month's *Arithmetic Teacher:*

- "The Patchwork Quilt: A Context for Problem Solving," Deborah A. Carey
- "Preparing Elementary Mathematics-Science Teaching Specialists," L. Diane Miller
- "A 'Handy' Database Activity for the Middle School Classroom," Christine A. Browning and Dwayne E. Channell

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